Erosion Control

Stabilize exposed soils

Chemical Stabilization

Construction Site Storm Water Runoff Control

Description

A truck applies chemical stabilizers to reduce soil erosion where vegetation can not be planted (Source: Terra Firma Industries, 1999)

Chemical stabilizers, also known as soil binders or soil palliatives, provide temporary soil stabilization. Materials made of vinyl, asphalt, or rubber are sprayed onto the surface of exposed soils to hold the soil in place and protect against erosion from runoff and wind. Chemicals used for stabilization are easily applied to the surface of the soil, can be effective in stabilizing areas where vegetative practices cannot be established, and provide immediate protection.

Applicability

Chemical stabilization can be used in areas where other methods of stabilization such as temporary seeding or permanent vegetation are not effective because of environmental constraints. They can also be used in combination with vegetative or perimeter practices to enhance erosion and sediment control.

Siting and Design Considerations

The application rates and procedures recommended by the manufacturer of a chemical stabilization product should be followed as closely as possible to prevent the products from forming ponds and to avoid creating impervious areas where storm water cannot infiltrate.

Limitations

Chemical stabilization can create impervious surfaces where water cannot infiltrate and which might increase storm water runoff. Overuse of chemical stabilizers might adversely affect water quality, although the chemicals' impacts on wildlife are still unknown. Additionally, chemical stabilization is usually more expensive than vegetative practices.

Maintenance Considerations

Chemically stabilized areas should be regularly inspected for signs of erosion. Stabilizers should be reapplied if necessary.

Effectiveness

Effectiveness of polymer stabilization methods ranges from 70 percent to 90 percent, although effectiveness of a particular polymer depends on soil type, application method, and individual chemical characteristics of the polymer (Aicardo, 1996).

Cost Considerations

Polyacrylamide, one of the more common soil palliatives, costs between $4 and $35 per pound; a pound can stabilize approximately 1 acre of land.

References

Aicardo, R. 1996. Screening of Polymers to Determine Their Potential Use in Erosion Control on Construction Sites. In *Proceedings from Conference held at College of Southern Idaho: Managing Irrigation-Induced Erosion and Infiltration with Polyacrylamide, May 6–8, 1996, Twin Falls, ID*. University of Idaho Miscellaneous Publication No. 101-96.

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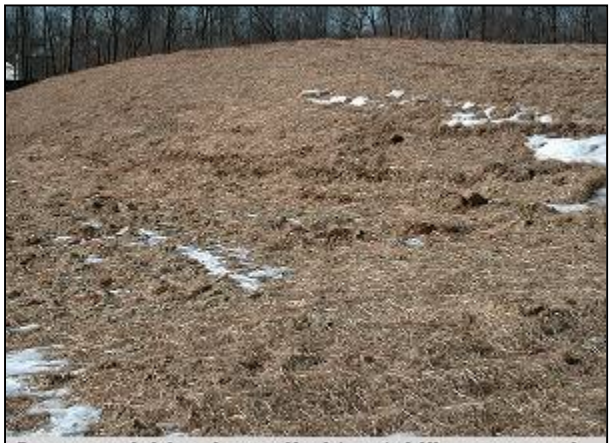
Mulching

Construction Site Storm Water Runoff Control

Description

Mulching is a temporary erosion control practice in which materials such as grass, hay, wood chips, wood fibers, straw, or gravel are placed on exposed or recently planted soil surfaces. Mulching is highly recommended as a stabilization method and is most effective when used in conjunction with vegetation establishment. In addition to stabilizing soils, mulching can reduce storm water runoff velocity. When used in combination with seeding or planting, mulching can aid plant growth by holding seeds, fertilizers, and topsoil in place, preventing birds from eating seeds, retaining moisture, and insulating plant roots against extreme temperatures.



Grass mulching is applied to stabilize exposed soils and to reduce storm water runoff velocity

Mulch mattings are materials such as jute or other wood fibers that are formed into sheets and are more stable than loose mulch. Jute and other wood fibers, plastic, paper, or cotton can be used individually or combined into mats to hold mulch to the ground. Netting can be used to stabilize soils while plants are growing, although netting does not retain moisture or insulate against extreme temperatures. Mulch binders consist of asphalt or synthetic materials that are sometimes used instead of netting to bind loose mulches.

Applicability

Mulching is often used in areas where temporary seeding cannot be used because of environmental constraints. Mulching can provide immediate, effective, and inexpensive erosion control. On steep slopes and critical areas such as waterways, mulch matting is used with netting or anchoring to hold it in place. Mulches can be used on seeded and planted areas where slopes are steeper than 2:1 or where sensitive seedlings require insulation from extreme temperatures or moisture retention.

Siting and Design Considerations

When possible, organic mulches should be used for erosion control and plant material establishment. Suggested materials include loose straw, netting, wood cellulose, or agricultural silage. All materials should be free of seed, and loose hay or straw should be anchored by applying tackifier, stapling netting over the top, or crimping with a mulch crimping tool. Materials that are heavy enough to stay in place (for example, gravel or bark or wood chips on flat slopes) do not need anchoring. Other examples include hydraulic mulch products with 100-percent post-consumer paper content, yard trimming composts, and wood mulch from recycled stumps and tree parts. Inorganic mulches such as pea gravel or crushed granite can be used in unvegetated areas.

Mulches may or may not require a binder, netting, or tacking. Effective use of netting and matting material requires firm, continuous contact between the materials and the soil. If there is no contact,

the material will not hold the soil and erosion will occur underneath the material. Grading is not necessary before mulching.

There must be adequate coverage to prevent erosion, washout, and poor plant establishment. If an appropriate tacking agent is not applied, or is applied in insufficient amounts, mulch is lost to wind and runoff. The channel grade and liner must be appropriate for the amount of runoff, or there will be resulting erosion of the channel bottom. Also, hydromulch should be applied in spring, summer, or fall to prevent deterioration of mulch before plants can become established. Table 1 presents guidelines for installing mulches.

Table 1. Typical mulching materials and application rates

Material	Rate per Acre	Requirements	Notes
Organic Mulches			
Straw	1–2 tons	Dry, unchopped, unweathered; avoid weeds.	Spread by hand or machine; must be tacked or tied down.
Wood fiber or wood cellulose	½–1 ton		Use with hydroseeder; may be used to tack straw. Do not use in hot, dry weather.
Wood chips	5–6 tons	Air dry. Add fertilizer N, 12 lb/ton.	Apply with blower, chip handler, or by hand. Not for fine turf areas.
Bark	35 yd^3	Air dry, shredded, or hammermilled, or chips	Apply with mulch blower, chip handler, or by hand. Do not use asphalt tack.
Nets and Mats			
Jute net	Cover area	Heavy, uniform; woven of single jute yarn. Used with organic mulch.	Withstands water flow.
Excelsior (wood fiber) mat	Cover area		
Fiberglass roving	½–1 ton	Continuous fibers of drawn glass bound together with a non-toxic agent.	Apply with compressed air ejector. Tack with emulsified asphalt at a rate of 25–35 gal./1000 $ft.^2$

Limitations

Mulching, matting, and netting might delay seed germination because the cover changes soil surface temperatures. The mulches themselves are subject to erosion and may be washed away in a large storm. Maintenance is necessary to ensure that mulches provide effective erosion control.

Maintenance Considerations

Mulches must be anchored to resist wind displacement. Netting should be removed when protection is no longer needed and disposed of in a landfill or composted. Mulched areas should be inspected frequently to identify areas where mulch has loosened or been removed, especially after rainstorms. Such areas should be reseeded (if necessary) and the mulch cover replaced immediately. Mulch

binders should be applied at rates recommended by the manufacturer. If washout, breakage, or erosion occurs, surfaces should be repaired, reseeded, and remulched, and new netting should be installed. Inspections should be continued until vegetation is firmly established.

Effectiveness

Mulching effectiveness varies according to the type of mulch used. Soil loss reduction for different mulches ranges from 53 to 99.8 percent. Water velocity reductions range from 24 to 78 percent. Table 2 shows soil loss and water velocity reductions for different mulch treatments.

Table 2. Measured reductions in soil loss for different mulch treatments (Source: Harding, 1990, as cited in USEPA, 1993)

Mulch Characteristics	Soil Loss Reduction (%)	Water Velocity Reduction (% relative to bare soil)
100% wheat straw/top net	97.5	73
100% wheat straw/two nets	98.6	56
70% wheat straw/30% coconut fiber	98.7	71
70% wheat straw/30% coconut fiber	99.5	78
100% coconut fiber	98.4	77
Nylon monofilament/two nets	99.8	74
Nylon monofilament/rigid/bonded	53.0	24
Vinyl monofilament/flexible/bonded	89.6	32
Curled wood fibers/top net	90.4	47
Curled wood fibers/two nets	93.5	59
Antiwash netting(jute)	91.8	59
Interwoven paper and thread	93.0	53
Uncrimped wheat straw, 2,242 kg/ha	84.0	45
Uncrimped wheat straw, 4,484 kg/ha	89.3	59

In addition, a study by Hetzog et al. (1998) concluded that mulching provides a high rate of sediment and nutrient pollution prevention. In addition, this study also found that seeding or mulching added value to a site in the eyes of the developers, real estate agents, and homebuyers that more than offset the cost of seeding or mulching.

Cost Considerations

Costs of seed and mulch average $1,500 per acre and range from $800 to $3,500 per acre (USEPA, 1993).

References

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